

Section 5

Transmission System Engineering

5.1 Transmission System Engineering

5.1.1 Introduction

Riverside Public Utilities (RPU) proposes to build and operate a nominal 96-megawatt (MW) simple-cycle power plant on a 12-acre fenced site within the City of Riverside, California. The proposed facility is referred to as the Riverside Energy Resource Center (RERC) Project (Project). RPU will develop, build, own and operate the facility. RERC will supply the internal needs of the City of Riverside during summer peak electrical demands and will serve the City's minimum emergency loads in the event RPU is islanded from the external transmission system. No power from RERC will be exported outside of the City.

This section describes the electric transmission facilities associated with the Riverside Energy Research Center RERC generation Project located at Riverside, California. Section 5.1.2 covers laws, ordinances, regulations and standards (LORS) associated with the Project. Section 5.1.3 covers subtransmission facilities. Section 5.1.4 addresses subtransmission interconnection engineering. Section 5.1.5 addresses subtransmission line safety and nuisance.

5.1.1.1 Project Description

The proposed site is owned by the City of Riverside and is located adjacent to the City of Riverside's Wastewater Treatment Plant (WWTP) in a light industrial/manufacturing area. The RERC will consist of two aero-derivative combustion turbine generators with SCRs, an on-site substation, approximately 1.75 miles of 69kV transmission line, natural gas and water supply interconnection, and on-site administration building and warehouse. The power plant and associated administration building and warehouse will occupy approximately 8 of 12 acres with the additional 4 acres reserved for equipment storage and, construction parking. The entire plant perimeter will be fenced with a combination of chain-link fencing and architectural block walls.

5.1.2 Laws, Ordinances, Regulations and Standards

This section describes LORS that apply to the proposed electric subtransmission system as well as line safety and nuisance issues.

5.1.2.1 Federal

There are no federal LORS related to the electric subtransmission system.

5.1.2.2 *State*

Design and Construction

LORS associated with design and construction of the proposed RERC electric subtransmission system are listed in Table 5.1-1.

Table 5.1-1 Design and Construction LORS

| LORS | Applicability |
|--|--|
| Title 8 CCR, Section 2700, "High Voltage Electrical Safety Orders" | Defines minimum requirements and standards for installation, operation and maintenance of electrical facilities to provide practical safety and freedom from danger. |
| ANSI/IEEE, "Recommended Practices for Seismic Design of Substations" | Provides recommended guidelines for substation design to prevent damage and to minimize the effects related to seismic events. |
| IEEE 1119, "Guide for Fence Safety Clearances in Electric Supply Stations" | Defines minimum clearances from electrical equipment to perimeter fences to protect persons outside of the station from electrical shock. |
| IEEE 998, "Direct Lightning Strike Shielding of Substations" | Provides guidelines for substation design to protect stations from direct lightning strikes. |
| IEEE 980, "Containment of Oil Spills for Substations" | Provides recommendations to prevent the release of substation equipment oil into the environment. |
| General Order 95/128, "Rules for Overhead Line Construction" | Provides requirements for electrical overhead construction in California. |
| ANSI – American National Standards Institute CCR – California Code of Regulation IEEE – Institute of Electrical and Electronic Engineers | |

5.1.2.3 *Local LORS*

No local LORS related to the transmission system engineering or transmission line safety and nuisance.

5.1.3 Subtransmission Facilities

5.1.3.1 *69kV Transmission Lines*

Currently, a 69kV transmission line exists from Mt. View Substation to Riverside Substation. Both Mt. View and Riverside Substations are owned and operated by the City. This existing line will be intercepted immediately outside of the Mt. View Substation and shall be divided into two segments: Mt. View to the RERC generation substation and Riverside Substation to the RERC generation substation. No outside utilities are involved. The line intercept point for the new line is located approximately 400 feet outside of Mt. View Substation. From the intercept point, the double-circuit 69kV line will extend approximately 9000 feet to the RERC facility. The lines will cross the railroad tracks on Sheppard Street and will be routed along the east side of Sheppard Street to Jurupa Avenue (approximately 600 feet). The line will continue along the south side of Jurupa Avenue to Payton Street (approximately 8000 feet) where the line will

extend along the east side of Payton Street to RERC (approximately 600 feet). The existing 12kV underbuild along the south side of Jurupa Avenue will be transferred to the new 69kV structures.

The new double-circuit 69kV line will be comprised of self-supporting galvanized steel and or wood poles with top of pole heights near 80 feet. Conductor selection for the new line is anticipated to be 954 ACSR. The existing line is comprised of 653.9 ACSR. The last spans into Mt. View will be upgraded to 954 ACSR as part of this Project. The 4 miles of remaining 653.9 ACSR to Riverside Substation will be replaced in the future. The 12kV underbuild will be placed on cross arms and customer services will be transferred to the new poles. Existing communications circuits (cable and phone) will also be transferred and the City will extend their fiber optic loop from Mt. View to the RERC facility, thereby adding a fiber optic communications circuit to the new line.

5.1.3.2 RERC Substation

The RERC high voltage substation shall comprise of the step up transformers, 69kV bus work, switches, arresters, insulators, interrupting devices, instrument transformers and associated galvanized steel structures. All insulators and bushings shall be ANSI 70 gray.

The initial 69kV substation shall be comprised of two full bays of breaker-and-a-half scheme consisting of six breakers, two 69kV line positions and two GSU positions. The ultimate layout will consist of four bays of breaker-and-a-half with a main north bus and main south bus and will accommodate four 69kV lines and a 4x2 generation facility.

5.1.3.3 Mt. View Substation

The existing HCB primary CR-8 backup relaying will be upgraded to the SEL 387L primary and the SEL 421 backup relaying for the line to RERC. Line breakers will be upgraded with new SF6, 2000A breakers.

5.1.3.4 Riverside Substation

The existing HCB primary CR-8 backup relaying will be upgraded to the SEL 387L primary and the SEL 421 backup relaying for the line to RERC. The line breaker will be upgraded with a new SF6, 2000A breaker. Three other line breakers will be replaced as indicated from the short circuit study.

5.1.4 Subtransmission Interconnection Engineering

5.1.4.1 Load Flow

The RERC facility will be connected to the RPU system via two 69kV transmission lines. One line will be connected to Mountain View Substation and will have a normal rating of 114 MW. The other line will be connected to Riverside Substation and will have a normal rating of 97 MW. The RPU system was studied under peak load conditions of 530 MW and no overloads were found with all lines in service and RERC net generation at 100 MW.

For loss of the RERC to Mountain View 69kV line, the RERC to Riverside line is loaded at 100.5 percent of normal and the Plaza to Riverside line is loaded to 105 percent of

normal. The RPU Transmission Line Planning Criteria allows 110 percent loading for loss of a single line. Therefore, the single-contingency loading is acceptable.

There is no line loading above normal rating for loss of the RERC to Riverside 69kV line.

The RPU 69kV network was also studied under minimum loading conditions of 125 MW. Loading for base case and contingency cases was less than 100 percent for minimum load conditions.

5.1.4.2 Short Circuit Study

Short-circuit analysis was performed by POWER Engineers Inc. and a formal report was issued September 2003. The study represented the existing system with the addition of the new 100 MW generation connected to Mt. View and Riverside substations. The results of the analysis (ASPEN software) indicated that three breakers at Mt. View could reach or exceed their interrupting capability: Mt. View to Freeman, Mt. View to Plaza and Mt. View to Vista. These overstressed breakers at Mt. View are being replaced with new SF6 breakers.